ANSWERS: Reactivity of metals with water

1) Calcium reacts with water vigorously to form a metal hydroxide and hydrogen gas. The water goes cloudy / milky as sparingly soluble calcium hydroxide forms, and there is fizzing, which indicates a gas (hydrogen).

$$Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$$

Magnesium does not generally react with cold water unless very clean.
(It will react in steam to produce white magnesium oxide and a gas.)

$$Mg(s) + H_2O(l) \rightarrow MgO(s) + H_2(g)$$

$$\text{(or: } Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2(s) + H_2(g)\text{)}$$

Magnesium is not as reactive as calcium because it is further down the activity series / it requires more energy to remove the valence electrons than calcium.

2) Lithium floats on water and gently fizzes, giving off hydrogen gas until it disappears. There is not as much heat produced, so Li does not melt. A colourless solution of LiOH is formed.

$$2Li(s) + 2H_2O(l) \rightarrow 2LiOH(aq) + H_2(g)$$

Sodium also floats on the surface, but enough heat is given off to melt the sodium (sodium has a lower melting point than lithium and the reaction produces heat faster) and it melts almost at once to form a small silvery ball that dashes around the surface, being pushed by the hydrogen being formed. A colourless solution of sodium hydroxide is formed. Sometimes the hydrogen may catch fire to burn with an orange flame. The colour is due to contamination of the normally blue hydrogen flame with sodium compounds.

$$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$$

3) <u>Products formed:</u>
Aqueous calcium hydroxide and hydrogen gas are formed when calcium reacts with <u>water.</u>
<u>Linking observations</u>:
The gas produced in the reaction of calcium with water is hydrogen.
<u>Balanced symbol equations</u>:

$$Ca_{(s)} + 2H_2O_{(l)} \rightarrow Ca(OH)_{2\,(aq)} + H_{2(g)}$$

Place on activity series:

Calcium is more reactive than copper according to the activity series. We can see that this is the case by looking at the results of the reaction of calcium with water.